


D4

(19)  **Europäisches Patentamt**
European Patent Office
Office européen des brevets



(11) **EP 1 412 063 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.12.2004 Bulletin 2004/53

(51) Int Cl.7: **B01D 63/00, B01D 61/36, C12G 3/08, C12H 1/16**

(21) Application number: **02770166.3**

(86) International application number:
PCT/IT2002/000472

(22) Date of filing: **18.07.2002**

(87) International publication number:
WO 2003/011440 (13.02.2003 Gazette 2003/07)

(54) **PROCESS AND PLANT FOR THE SEPARATION OF UNDESIRABLE SUBSTANCES FROM ALIMENTARY LIQUIDS, IN PARTICULAR FROM WINE**
VERFAHREN UND ANLAGE ZUR TRENNUNG VON UNERWÜNSCHTEN STOFFEN VON FLÜSSIGEN NAHRUNGSMITTELN, INSBESONDERE VON WEIN
PROCEDE ET INSTALLATION PERMETTANT DE SEPARER DES SUBSTANCES INDESIRABLE DE LIQUIDES ALIMENTAIRES, NOTAMMENT DU VIN

<p>(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR</p> <p>(30) Priority: 31.07.2001 IT VI20010016</p> <p>(43) Date of publication of application: 28.04.2004 Bulletin 2004/18</p> <p>(73) Proprietor: Enologica Vason S.r.l. 37020 Pedemonte, Verona (IT)</p>	<p>(72) Inventor: FERRARINI, Roberto I-37020 Fumane (IT)</p> <p>(74) Representative: Gerblino, Angelo et al Jacobacci & Partners S.p.A. Via Berchet 9 35131 Padova (IT)</p> <p>(56) References cited: WO-A-93/08257 WO-A-93/22036 DE-C- 4 109 080 US-A- 5 480 665 US-A- 5 817 359</p>
---	---

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 412 063 B1

Description

Technical field

[0001] The present invention concerns a process and a plant for the separation of undesirable substances from alimentary liquids, in particular from wine. The invention in question is intended to be advantageously used in the oenology sector for the refinement of wine, namely in order to improve the organoleptic properties and taste thereof or reduce certain components which are present in excessive amounts.

Background art

[0002] At present, as is known, the wine industry makes widespread use of microfiltration plants, or sub-micronic filtration (ultrafiltration or nanofiltration) plants, which use semipermeable membranes generally formed by thin polymer films in order to separate some components from others.

[0003] The passage of the wine to be filtered through the membrane is usually obtained by means of mechanical overpressure. These membrane-type filtration plants have major operational limitations in that they do not allow the separation of all the undesirable components, for example because of their dimensions which in some cases are excessively small, their polarity or their surface tension. These plants, therefore, are suitable only for implementing given filtration processes of the type for example described in the patents IT 1,249,187 and IT 1,242,866.

[0004] Moreover, numerous plants based on the principle of (direct or reverse osmosis) are known, said plants being able to achieve, by means of a semipermeable membrane, purification of solutions, separating a permeated fraction from a retained fraction. Reverse osmosis in particular is a known dual-action process which allows, on the one hand, the purification of solutions, eliminating undesirable substances (for example salts) and, on the other hand, the concentration of solutions, extracting water or other solvent from the initial product.

[0005] In the oenology sector, reverse osmosis is currently used in methods for concentrating wine or fruit juices with a low sugar content, as described in the patent US 3,979,521, or in order to extract volatile esters with a low molecular weight (such as, for example, methylanthranilate) from wine or must, as described in the patent US 4,401,678, or in order to remove water or a more or less important part of alcohol from wine as described in the patents US 4,999,209, US 4,888,189, US 4,681,767, FR 2,653,443, GB 2,133,418, IT 1,242,865, WO/03902 and WO/08783.

[0006] A method and an apparatus for the treatment of fluids and in particular wine, able to separate a retained fraction from a permeated fraction in a reverse osmosis unit, is also known from the American patent

No. US 5,480,665. The latter receives inside it the undesirable substances such as, for example, the volatile acidity components (ethyl acetate and acetic acid) which are then removed by means of a subsequent treatment. For this purpose, the permeated fraction is passed through an adsorbent column able to remove the acetic acid by means of anion-exchange resins and the ethyl acetate by means of hydrolysis.

[0007] With this treatment it is therefore possible to purify, of the undesirable substances, the permeated fraction which is then reintroduced into the wine, obtaining a final product which is substantially devoid of volatile acidity. Advantageously, this method envisages also treating the permeated fraction with a low-temperature distillation process in order to remove CO₂, H₂S, acetaldehyde or other volatile components.

[0008] Methods for treating wine in order to lower the total acidity by means of ion-exchange resin columns are per se already known and for example described and illustrated in the patent US 4,205,092.

[0009] The processes for separation of undesirable substances briefly described hitherto have in practice proved to be unsatisfactory in terms of performance. In other words, with these processes and associated plants it is not possible to select adequately only the undesirable substances, and therefore inevitably also substances - which instead make a positive contribution to the quality of the wine - are removed together therewith.

[0010] The document WO-A-9308257 describes the removal of alcohol from aqueous solutions by pervaporation with substantially pure water as extraction liquid.

Disclosure of the invention

[0011] In this situation the task underlying the present invention is to eliminate the drawbacks of the above-mentioned prior art by providing a process and a plant for the separation of undesirable substances from alimentary liquids, in particular from wine, which allow an improvement in the quality of the product obtained by means of an improved action involving selective purification of only the undesirable substances.

[0012] Another object of the present invention is that of providing a process and a plant for the separation of undesirable substances from alimentary liquids, in particular from wine, which is constructionally simple and operationally entirely reliable.

[0013] These and other objects are all achieved by a process for the separation of undesirable substances from alimentary liquids, in particular from wine, which is characterized in that it comprises the operating steps of: preparing said liquid to be treated inside a container; conveying said liquid to be treated to a filtration unit provided with hydrophobic membranes having holes for trapping gas and able to be passed along, on a first side, by said liquid to be treated and, on a second side, by an extraction fluid having an alcoholic content substantially similar to that of said liquid to be treated and made to

circulate in a purification circuit; removal of undesirable volatile substances from said liquid to be treated by means of evaporation and subsequent diffusion thereof in the gas trapped in the membranes and consequent condensation of the volatile substances on the second side of the membranes, with the formation of a contaminated fluid formed by the extraction fluid and the permeated volatile substances and a retained fraction formed by the treated liquid purified of the permeated volatile substances.

[0014] According to the invention the said objects are also achieved by means of a plant for the separation of undesirable substances from alimentary liquids, in particular from wine, characterized in that it comprises a container for said liquid to be treated, a filtration unit provided with hydrophobic membranes having holes for trapping gas, first circulation means for conveying the wine to be treated through the filtration unit, causing it to pass along a first side of the membranes; second circulation means for causing the flow of an extraction fluid having an alcoholic content substantially similar to that of said liquid to be treated in a purification circuit through the filtration unit, causing it to pass along the second side of the membranes; the membranes removing from said liquid to be treated the undesirable volatile substances by means of evaporation and subsequent diffusion thereof in the gas trapped in the membranes and consequent condensation thereof on the second side of the membranes, with the formation of a contaminated fluid formed by the extraction fluid enriched with the permeated volatile substances, and a retained fraction formed by the treated wine purified of the volatile substances; the purification circuit supplying by means of the second circulation means at least one unit for separation of the volatile substances from the contaminated fluid.

[0015] This process and this plant allow an effective improvement in the quality of the wine treated and are particularly suitable for use with wines having an excessive volatile acidity content.

Brief description of the drawings

[0016] The technical characteristics of the invention, in accordance with the abovementioned objects, may be clearly determined from the contents of the claims below and the advantages thereof will emerge more clearly from the detailed description which follows, with reference to the accompanying drawings, which show a purely exemplary nonlimiting example of embodiment thereof and in which:

FIG. 1 shows a functional logic diagram of the process and the plant for the separation of undesirable substances from alimentary liquids, in particular from wine, according to the present invention;

FIG. 2 is a schematic illustration of the operating principle of the hydrophobic membranes used in the

process and in the plant in question.

Detailed description of a preferred example of embodiment

[0017] With reference to the accompanying figures, 1 denotes in its entirety the plant for implementing a process for the separation of undesirable substances from alimentary liquids, in particular from wine, according to the present invention.

[0018] This plant 1 is intended to be used in the food industry in general, and in particular in the oenology sector, in order to treat a very large number of different types of alimentary liquids. Below, for the sake of simplicity of the description, reference will be made only to the example of an oenological product such as wine or wine must, without, as a result, the use of this plant with other alimentary liquids departing from the protective scope of the present patent.

[0019] The plant 1 essentially comprises a container 2 for wine to be treated V, a unit 3 which has hydrophobic membranes 4 with holes for trapping a gas G and the function and structure of which will be described more clearly below, and first circulation means 6 for causing the wine V to flow through the unit 3, causing it to pass along a first side 4' of the membranes 4.

[0020] The second side 4" of the membranes 4 is instead passed along by an extraction fluid L which is conveyed by second circulation means 7 inside a closed purification circuit 8. The extraction fluid L consists of a liquid solution having an alcoholic content substantially similar to that of the wine V which can be obtained, for example, as will be seen below, also with a part of wine devoid of undesirable substances.

[0021] The membranes 4, which are of the type marketed for example by GORE TEX or PALL and already known in the industrial sector and in the medical field, are hydrophobic, i.e. consist of hydrophobic polymers with a high molecular weight, generally polypropylene or polytetrafluoroethylene, forming a three-dimensional structure with pores having a diameter preferably in the region of a tenth of a micrometre able to retain inside them gas, generally consisting of air. This structure, as is known, is impermeable to water, but permeable to gases. These same membranes made of hydrophobic material (permeation membranes) differ from each other in terms of thickness, permeability to air, diameter of the pores, etc.

[0022] Fig. 2 shows in schematic form a membrane 4 of the type mentioned above, which is passed along tangentially, on both sides 4', 4", by the wine V and the extraction fluid L, respectively.

[0023] The passage, from one side to the other of the membrane 4, of one or more substances occurs substantially in accordance with the principle of (direct) osmosis whereby a semipermeable membrane placed so as to make contact with and separate two solutions having a solute with different concentration allows, in given

conditions, the through-flow of solvent from one side to the other of the membrane so as to re-establish an equal concentration in the two solutions.

[0024] In the plant 1 and in the process in question, however, the membranes 4 of the type described above do not participate directly in the removal of the undesirable substances by means of a selective action due to their intrinsic characteristics, as instead occurs in the case where osmotic membranes are used.

[0025] The membranes 4 used in the process and in the plant according to the present invention regulate the through-flow of the undesirable volatile substances which are present in the wine in a greater concentration than in the extraction fluid L by means a complex mechanism illustrated schematically in Fig. 2. This mechanism, which is known per se, envisages the evaporation of one or more undesirable volatile substances (for example acetic acid, ethyl acetate, acetaldehyde, volatile substances with an undesirable odour, etc.) on the first side 4' of the membrane 4, the diffusion therefore inside the gas G retained in the pores 5 and then the condensation thereof on the second side 4" of the membrane 4 so as to then be evacuated by the extraction fluid circulating in the purification circuit 8.

[0026] In accordance with the physical principle forming the basis of operation of the membrane, the through-flow of the volatile substances is regulated by the value of the partial pressures of the individual components in the two liquids on the sides of the membrane.

[0027] The action of the membrane 4 basically results in the formation of a contaminated fluid L', which is composed of the extraction fluid L enriched with the volatile substances which have passed through the membrane 4, and a retained fraction composed of the treated wine V' purified of the volatile substances.

[0028] At this point, in accordance with the diagram of the plant illustrated in Fig. 1, the contaminated fluid L' which advances in the purification circuit 8 is made to pass through a separation unit 9 having the purpose of eliminating the volatile substances and regenerating in this way the extraction fluid L.

[0029] Advantageously the separation unit 9 may be formed by means of an anion-exchange resin filtration column (as indicated in Fig. 1) particularly suitable for removing acetic acid and/or ethyl acetate by means of basic sites having an electrostatic action with for example NH_3^+ groups. Alternatively or in parallel the contaminated fluid L' may also be sent to a distillation column (not shown since it is of a type known per se) in order to extract acetaldehyde, or H_2S , or certain volatile esters responsible for unpleasant aromas. Obviously, the purification of the contaminated fluid may also be obtained by means of filtration processes involving ion-exchange resins or using other methods such as adsorption onto polymers, extraction with solvents, or the like.

[0030] The present invention also relates to a process for the separation of undesirable substances from alimentary liquids - in particular able to be implemented by

means of the plant 1 described above - which is illustrated in the accompanying Fig. 1.

[0031] Operationally speaking, it comprises according to the invention the steps of preparing the wine V to be treated inside the container 2, subsequent conveying of a flow of this wine V into the unit 3 described above and consequent removal therefrom of the undesirable volatile substances by means of the passage of the said substances through the hydrophobic membranes 4 in the manner described above. These steps thus result in the formation of a contaminated fluid L' composed of the extraction fluid L and the undesirable volatile substances and a retained fraction formed by the treated wine V' purified of the said undesirable volatile substances.

[0032] At this point, the final step of re-introduction of the treated wine V' into the container 2 follows. This cycle is repeated until, inside the container, there is a concentration of the individual undesirable substances which is sufficiently low, for example less than a predetermined threshold value.

[0033] Advantageously, in accordance with a further characteristic feature of the present process, the contaminated fluid L' is again subjected to a step involving conveying into the separation unit 9 indicated above, where it undergoes a step involving removal of the undesirable volatile substances. This is then followed by a step involving re-introduction of the regenerated extraction fluid L inside the purification circuit 8.

[0034] The step involving removal of the volatile substances from the extraction fluid L may be obtained by means of an ion-exchange process or by means of a distillation process.

[0035] The invention thus conceived therefore achieves the predefined objects.

[0036] Obviously, during its practical realisation, the invention may also assume forms and configurations different from that illustrated above without thereby departing from the present scope of protection.

[0037] Moreover, all the details may be replaced by technically equivalent elements and the dimensions, forms and materials used may be any according to requirements and in particular both plastic and metal may be used.

Claims

1. Process for the separation of undesirable substances from alimentary liquids, in particular from wine, characterized in that it comprises the following operating steps:

- preparing said liquid to be treated (V) inside a container (2);
- conveying said liquid (V) to be treated to a unit (3) with hydrophobic membranes (4) having holes (5) for trapping gas (G) and able to be passed along, on a first side (4'), by said liquid

- to be treated (V) and, on a second side (4"), by an extraction fluid (L) having an alcoholic content substantially similar to that of said liquid (V) to be treated and made to circulate inside a purification circuit (8);
- removal of undesirable volatile substances from said liquid to be treated (V) by means of evaporation and subsequent diffusion thereof in said gas (G) trapped in said membranes (4) and consequent condensation of said volatile substances on said second side (4") of the membranes (4), with the formation of a contaminated fluid (L') formed by said extraction fluid (L) and by the permeated volatile substances, and a retained fraction formed by said treated liquid (V') purified of said permeated volatile substances.
2. Process according to Claim 1, characterized in that said liquid is wine and that it also comprises the step of re-introducing said treated wine (V') into said container (2).
 3. Process according to Claim 1, characterized in that it also comprises the steps of:
 - conveying said contaminated fluid (L') into a separation unit (9) by means of said purification circuit (8);
 - removing said volatile substances from said contaminated fluid (L') with consequent regeneration of said extraction fluid (L);
 - re-introducing said regenerated extraction fluid (L) into said purification circuit (8).
 4. Process according to Claim 1, characterized in that said undesirable volatile substances consist of one or more components contained in the family comprising: acetic acid, ethyl acetate, acetaldehyde, sulphur dioxide, sulphurated organic compounds or other undesirable volatile compounds.
 5. Process according to any one of the preceding claims, characterized in that said extraction fluid (L) consists of wine devoid of said undesirable substances.
 6. Process according to Claim 3, characterized in that said step of removing said volatile substances from said contaminated fluid (L') is obtained by means of ion exchange, in particular anion exchange.
 7. Process according to one or more of Claims 1, 2 and 3, characterized in that said steps are repeated cyclically.
 8. Process according to Claim 1, characterized in that said membranes (4) consist of hydrophobic polymers with a high molecular weight, such as polypropylene or polytetrafluoroethylene.
 9. Plant for the separation of undesirable substances from alimentary liquids, in particular from wine, characterized in that it comprises:
 - a container (2) for said liquid to be treated (V);
 - a unit (3) having hydrophobic membranes (4) with holes for trapping gas (G);
 - first circulation means (6) for conveying said liquid to be treated (V) through said unit (3), causing it to pass along a first side (4') of said membranes (4);
 - second circulation means (7) for causing the flow of an extraction fluid (L) having an alcoholic content substantially similar to that of said liquid to be treated (V), inside a purification circuit (8) through said unit (3), causing it to pass along the second side (4") of said membranes (4);

said membranes (4) removing from said liquid to be treated (V) said undesirable volatile substances by means of evaporation and subsequent diffusion thereof in the gas (G) trapped in said membranes (4) and consequent condensation thereof on said second side (4") of said membranes (4), with the formation of a contaminated fluid (L') formed by said extraction fluid (L) enriched with said permeated volatile substances, and a retained fraction (V') formed by said treated wine (V') purified of said volatile substances;

said purification circuit (8) supplying by means of said second circulation means (7) at least one unit (9) for separation of said volatile substances from said contaminated fluid (L').
 10. Plant according to Claim 9, characterized in that said separation unit (9) consists of an ion-exchange resin filtration column.
 11. Plant according to Claim 9, characterized in that said separation unit (9) consists of a distillation column.
 12. Plant according to Claim 9, characterized in that said separation unit (9) consists of an ion-exchange resin filtration unit or a unit for adsorption onto polymers.
 13. Plant according to Claim 9, characterized in that said membranes (4) are formed by hydrophobic polymers with a high molecular weight, such as polypropylene or polytetrafluoroethylene.
 14. Plant according to Claim 9, characterized in that

said purification circuit (8) is a closed circuit.

Patentansprüche

1. Verfahren zur Trennung von unerwünschten Stoffen von flüssigen Nahrungsmitteln, insbesondere von Wein, **dadurch gekennzeichnet, dass es die folgenden Arbeitsschritte enthält:**

- Vorbereiten der zu behandelnden Flüssigkeit (V) in einem Behälter (2);
- Fördern der zu behandelnden Flüssigkeit (V) zu einer Einheit (3) mit hydrophoben Membranen (4), die Löcher (5) zum Einschließen von Gas (G) haben und die so ausgelegt sind, dass auf einer ersten Seite (4') die zu behandelnde Flüssigkeit (V) und auf einer zweiten Seite (4'') ein Extraktionsfluid (L) vorbeigeleitet wird, das einen Alkoholgehalt hat, der im wesentlichen ähnlich demjenigen der zu behandelnden Flüssigkeit (V) ist und das innerhalb eines Reinigungskreislaufs (8) zirkuliert wird;
- Entfernen von unerwünschten flüchtigen Stoffen aus der zu behandelnden Flüssigkeit (V) mittels Verdampfung und nachfolgender Diffusion derselben in das in den Membranen (4) eingeschlossene Gas (G) und nachfolgender Kondensation der flüchtigen Stoffe auf der zweiten Seite (4'') der Membranen (4) unter Bildung eines verunreinigten Fluids (L'), das aus dem Extraktionsfluid (L) und den permeierten flüchtigen Stoffen gebildet wird, und einer zurückgehaltenen Fraktion, die aus der behandelten Flüssigkeit (V) gebildet wird, die von den permeierten flüchtigen Stoffen gereinigt ist.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass die Flüssigkeit Wein ist und dass es ferner den Schritt des Rückführens des behandelten Weines (V') in den Behälter (2) enthält.**

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass es ferner die Schritte enthält:**

- Fördern des verunreinigten Fluids (L') in eine Trennungseinheit (9) mittels des Reinigungskreislaufs (8);
- Entfernen der flüchtigen Stoffe aus dem verunreinigten Fluid (L') mit der nachfolgenden Regeneration des Extraktionsfluids (L);
- Wiedereinführen des regenerierten Extraktionsfluids (L) in den Reinigungskreislauf (8).

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass die unerwünschten flüchtigen Stoffe aus einem oder mehreren Bestandteilen bestehen, die in der Familie enthalten sind, welche um-**

fasst: Essigsäure, Acetacetat, Acetaldehyd, Schwefeldioxid, schwefelige organische Verbindungen und andere unerwünschte flüchtige Verbindungen.

5. Verfahren nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass das Extraktionsfluid (L) aus Wein besteht, der die unerwünschten Stoffe nicht enthält.**

6. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass der Schritt des Entferns der flüchtigen Stoffe aus dem verunreinigten Fluid (L') durch Ionenaustausch, insbesondere Anionenaustausch erzielt wird.**

7. Verfahren nach einem oder mehreren der Ansprüche 1, 2 und 3, **dadurch gekennzeichnet, dass die Schritte zyklisch wiederholt werden.**

8. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass die Membranen (4) aus hydrophoben Polymeren mit einem hohen Molekulargewicht, wie z. B. Polypropylen oder Polytetrafluorethylen bestehen.**

9. Anlage zur Trennung von unerwünschten Stoffen von flüssigen Nahrungsmitteln, insbesondere von Wein, **dadurch gekennzeichnet, dass sie enthält:**

- einen Behälter (2) für die zu behandelnde Flüssigkeit (V);
- eine Einheit (3), die hydrophobe Membranen (4) mit Löchern zum Einschließen von Gas (G) hat;
- eine erste Zirkulationseinrichtung (6) zum Fördern der zu behandelnden Flüssigkeit (V) durch die Einheit (3), wobei sie veranlasst wird, an einer ersten Seite (4') der Membranen (4) entlangzuströmen;
- eine zweite Zirkulationseinrichtung (7), um den Strom eines Extraktionsfluids (L), das einen Alkoholgehalt hat, der im wesentlichen demjenigen der zu behandelnden Flüssigkeit (V) ähnlich ist, innerhalb eines Reinigungskreislaufs (8) durch die Einheit (3) zu veranlassen, wobei es veranlasst wird, an der zweiten Seite (4'') der Membranen (4) entlangzuströmen;

wobei die Membranen (4) aus der zu behandelnden Flüssigkeit (V) die unerwünschten flüchtigen Stoffe mittels Verdampfung und nachfolgender Diffusion derselben in das in den Membranen (4) eingeschlossene Gas (G) und nachfolgende Kondensation derselben auf der zweiten Seite (4'') der Membranen (4) entfernen, und zwar unter Bildung eines verunreinigten Fluids (L'), das durch das Extraktionsfluid (L) gebildet ist, das mit den permeierten

flüchtigen Stoffen angereichert ist, und einer zurückgehaltenen Fraktion (V'), die durch den behandelten Wein (V') gebildet ist, der von den flüchtigen Stoffen gereinigt ist;

wobei der Reinigungskreislauf (8) mittels der zweiten Zirkulationseinrichtung (7) mindestens eine Einheit (9) zur Trennung der flüchtigen Stoffe von dem verunreinigten Fluid (L') versorgt.

10. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass die Trennungseinheit (9) aus einer Ionenaustauschharz-Filtrationssäule besteht.

11. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass die Trennungseinheit (9) aus einer Destillationskolonne besteht.

12. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass die Trennungseinheit (9) aus einer Ionenaustauschharz-Filtrationseinheit oder einer Einheit zur Adsorption an Polymeren besteht.

13. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass die Membranen (4) aus hydrophoben Polymeren mit einem hohen Molekulargewicht, wie z. B. Polypropylen oder Polytetrafluorethylen, gebildet sind.

14. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass der Reinigungskreislauf (8) ein geschlossener Kreislauf ist.

Revendications

1. Procédé pour la séparation de substances indésirables de liquides alimentaires, en particulier de vin, caractérisé en ce qu'il comprend les étapes opératoires suivantes :

- préparer ledit liquide à traiter (V) à l'intérieur d'un conteneur (2) ;
- transporter ledit liquide (V) à traiter vers une unité (3) avec des membranes hydrophobes (4) ayant des trous (5) pour piéger du gaz (G) et capables d'être parcourues, d'un premier côté (4'), par ledit liquide à traiter (V) et, d'un second côté (4''), par un fluide d'extraction (L) ayant une teneur alcoolique sensiblement similaire à celle dudit liquide (V) à traiter et conçu pour circuler à l'intérieur d'un circuit de purification (8) ;
- éliminer des substances volatiles indésirables dudit liquide à traiter (V) par l'intermédiaire d'évaporation et diffusion subséquente de celles-ci dans ledit gaz (G) piégé dans lesdites membranes (4) et condensation résultante desdites substances volatiles sur ledit second côté (4'') des membranes (4), avec la formation

d'un fluide contaminé (L') formé par ledit fluide d'extraction (L) et par les substances volatiles filtrées, et une fraction retenue formée par ledit liquide traité (V) purifié desdites substances volatiles filtrées.

2. Procédé selon la revendication 1, caractérisé en ce que ledit liquide est du vin et en ce qu'il comprend également l'étape de réintroduire ledit vin traité (V') dans ledit conteneur (2).

3. Procédé selon la revendication 1, caractérisé en ce qu'il comprend les étapes de :

- transporter ledit fluide contaminé (L') dans une unité de séparation (9) par l'intermédiaire dudit circuit de purification (8) ;
- éliminer lesdites substances volatiles dudit fluide contaminé (L') avec régénération résultante dudit fluide d'extraction (L) ;
- réintroduire ledit fluide d'extraction régénéré (L) dans ledit circuit de purification (8).

4. Procédé selon la revendication 1, caractérisé en ce que lesdites substances volatiles indésirables se composent d'un ou de plusieurs composants contenus dans la famille comprenant : l'acide acétique, l'acétate d'éthyle, l'acétaldéhyde, l'anhydride sulfureux, des composés organiques sulfurés ou d'autres composés volatiles indésirables.

5. Procédé selon une quelconque des revendications précédentes, caractérisé en ce que ledit fluide d'extraction (L) consiste en du vin dépourvu desdites substances indésirables.

6. Procédé selon la revendication 3, caractérisé en ce que ladite étape d'élimination desdites substances volatiles à partir dudit fluide contaminé (L') est obtenue par l'intermédiaire d'échange ionique, en particulier d'échange anionique.

7. Procédé selon l'une ou plusieurs des revendications 1, 2 et 3, caractérisé en ce que lesdites étapes sont répétées cycliquement.

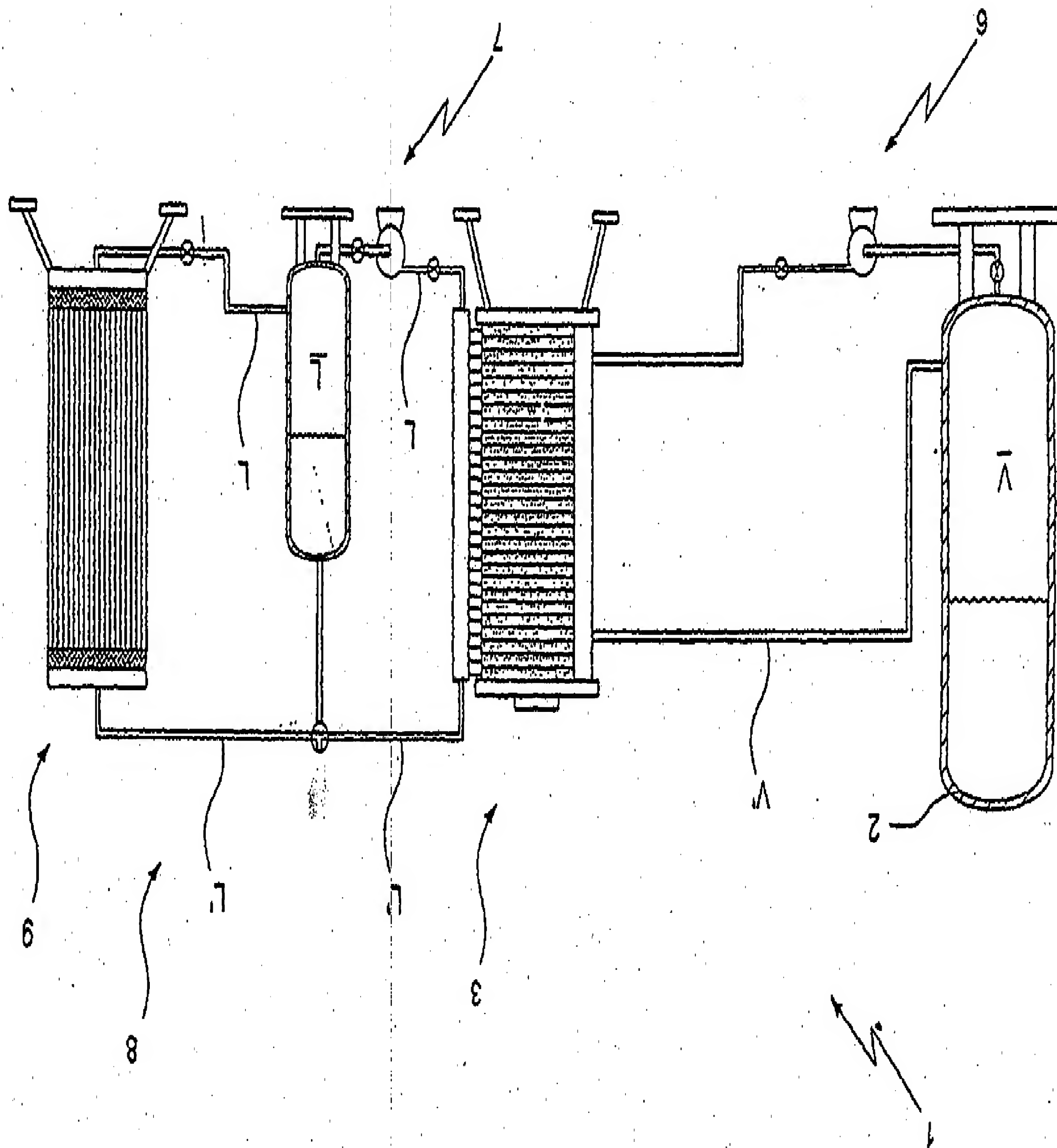
8. Procédé selon la revendication 1, caractérisé en ce que lesdites membranes (4) se composent de polymères hydrophobes ayant un poids moléculaire élevé, tels que du polypropylène ou du polytétrafluoroéthylène.

9. Installation pour la séparation de substances indésirables de liquides alimentaires, en particulier de

vin,

caractérisée en ce qu'elle comprend :

- un conteneur (2) pour ledit liquide à traiter (V) ;
 - une unité (3) ayant des membranes hydrophobes (4) avec des trous pour piéger du gaz (G) ;
 - des premiers moyens de circulation (6) pour transporter ledit liquide à traiter (V) à travers ladite unité (3), pour l'entraîner à passer le long d'un premier côté (4') de ladite membrane (4) ;
 - des seconds moyens de circulation (7) pour entraîner l'écoulement d'un fluide d'extraction (L) ayant une teneur alcoolique sensiblement similaire à celle dudit liquide à traiter (V), à l'intérieur d'un circuit de purification (8) à travers ladite unité (3), pour l'entraîner à passer le long du second côté (4'') desdites membranes (4) ;
- lesdites membranes (4) éliminant dudit liquide à traiter (V) lesdites substances volatiles indésirables par l'intermédiaire d'évaporation et diffusion subséquente de celles-ci dans le gaz (G) piégé dans lesdites membranes (4) et condensation résultante de celles-ci sur ledit second côté (4'') desdites membranes (4), avec la formation d'un fluide contaminé (L') formé par ledit fluide d'extraction (L) enrichi avec lesdites substances volatiles filtrées, et une fraction retenue (V') formée par ledit vin traité (V) purifié desdites substances volatiles ;
- ledit circuit de purification (8) alimentant par l'intermédiaire desdits seconds moyens de circulation (7), au moins une unité (9) pour séparer lesdites substances volatiles dudit fluide contaminé (L').
10. Installation selon la revendication 9, caractérisée en ce que ladite unité de séparation (9) comprend une colonne de filtration à résine échangeuse d'ions.
11. Installation selon la revendication 9, caractérisée en ce que ladite unité de séparation (9) comprend une colonne de distillation (12).
12. Installation selon la revendication 9, caractérisée en ce que ladite unité de séparation (9) comprend une unité de filtration à résine échangeuse d'ions ou une unité pour l'adsorption sur polymères.
13. Installation selon la revendication 9, caractérisée en ce que lesdites membranes (4) sont formées par des polymères hydrophobes ayant un poids moléculaire élevé, tels que du polypropylène ou du polytétrafluoroéthylène.
14. Installation selon la revendication 9, caractérisée en ce que ledit circuit de purification (8) est un circuit fermé.



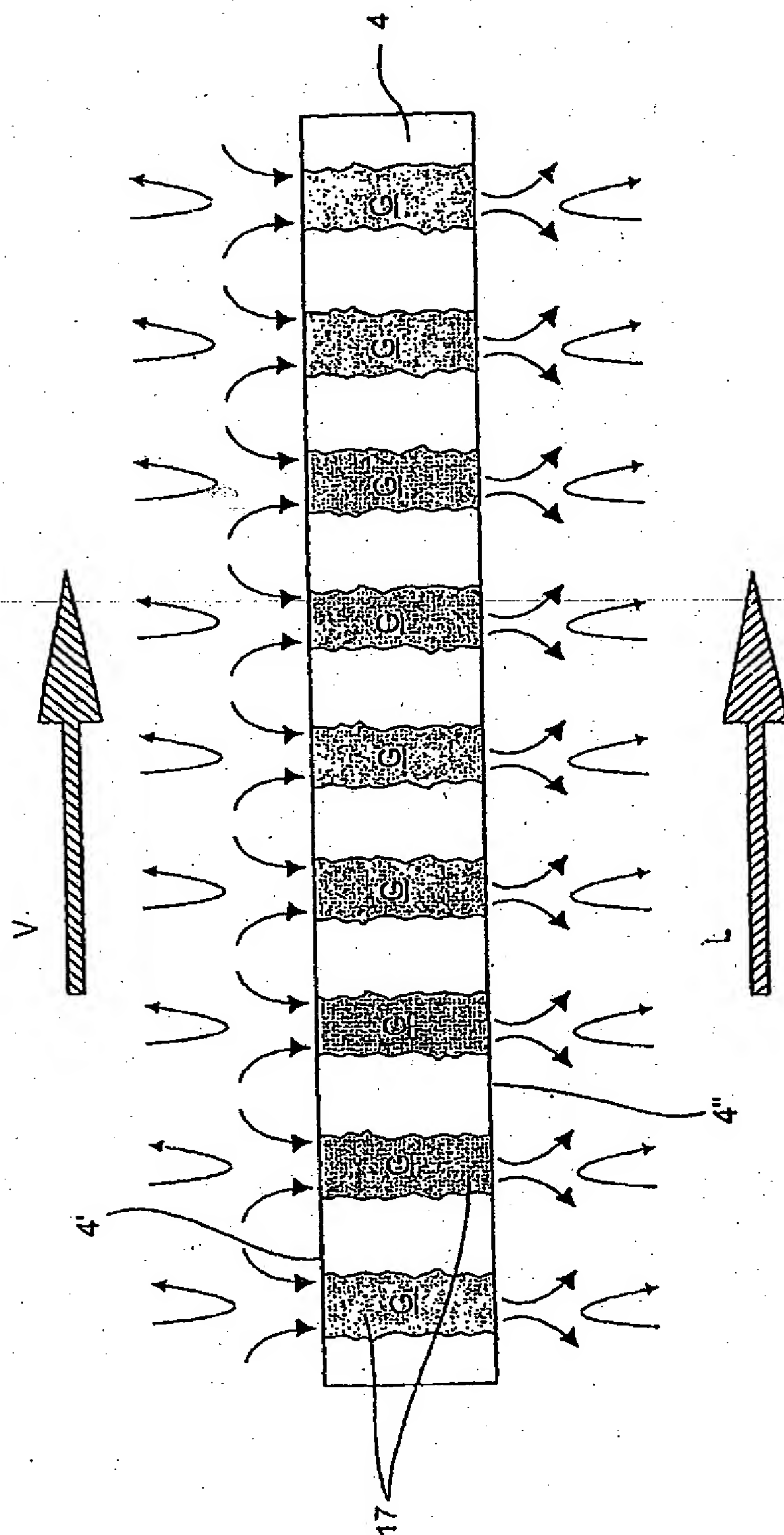


Fig. 2